

CLAIMS

What is claimed is:

1. An apparatus for forming and joining a first sheet material to a second sheet material, the apparatus comprising:
 - a nest for holding the first sheet material;
 - a robotic arm operatively associated with said nest; and
 - a positional pressure roller tool for forming and joining the first sheet material to the second sheet material, said positional pressure roller tool being operatively associated with said robotic arm.
2. The apparatus of Claim 1 further including a computer having a roller tool-driving program, said computer being operatively associated with said robotic arm and said positional pressure roller tool.
3. The apparatus of Claim 1 further including a biasing element for biasing said positional pressure roller tool against the second sheet material and the first sheet material during the forming and joining of the first sheet material to the second sheet material.
4. The apparatus of Claim 3 wherein said biasing element is a spring.
5. The apparatus of Claim 3 wherein said biasing element comprises a gas-charged cylinder.

6. The apparatus of Claim 1 wherein said positional pressure roller tool includes a main roller and a touch-up roller.

7. The apparatus of Claim 6 wherein said main roller and said touch-up roller share a common hub, said common hub being rotatably attached to said robotic arm.

8. The apparatus of Claim 1 wherein said nest includes a peripheral surface upon which the first sheet material and the second sheet material are placed for forming and joining by said positional pressure roller tool.

9. An apparatus for forming and joining a first sheet material to a second sheet material, the first sheet material having a periphery, the periphery having a contour, the apparatus comprising:

a nest for holding the first sheet material, said nest including a material-contacting portion, said material-contacting portion being defined to substantially cooperate with the contour of the periphery of the first sheet material;

a forming and joining assembly operatively associated with said nest, said assembly including a robotic arm and a positional pressure roller tool, said positional pressure roller tool including a roller which forms and joins the first sheet material to the second sheet material by rolling the first sheet material and the second sheet material between the nest and the roller; and

a computer having a roller tool-driving program, said computer being operatively associated with said forming and joining assembly.

10. The apparatus of Claim 9 further including a biasing element for biasing said positional pressure roller tool against the second sheet material and the first sheet material during the forming and joining of the first sheet material to the second sheet material.

11. The apparatus of Claim 10 wherein said biasing element is a spring.

12. The apparatus of Claim 10 wherein said biasing element comprises a gas-charged cylinder.

13. The apparatus of Claim 9 wherein said positional pressure roller tool includes a main roller and a touch-up roller.

14. The apparatus of Claim 13 wherein said main roller and said touch-up roller share a common hub, said common hub being rotatably attached to said robotic arm.

15. The apparatus of Claim 13 wherein said touch-up roller includes a tool insert aperture and an interchangeable tool insert.

16. The apparatus of Claim 15 wherein said touch-up roller further includes ball lock for selectively engaging said interchangeable tool insert.

17. A method for forming and joining a first sheet material to a second sheet material, the first sheet material having a periphery, the periphery having a contour, the method comprising:

holding a first sheet material in a nest such that a periphery of said first sheet material is supported on a material contacting portion of said nest;

placing a second sheet material on top of said first sheet material;

locating a robotic arm having a positional pressure roller tool having a roller relative to said nest such that said roller engages a flange extending from said periphery; and

manipulating said robotic arm to move said positional pressure roller tool along a tool path such that said roller forms said flange over a periphery of said second sheet material, wherein the position of said robotic relative to the nest dictates an applied pressure between said roller and said material contacting portion.

18. The method of Claim 17 further comprises executing a roller tool-driving program in a controller for manipulating said robotic arm such that said applied pressure is varied along said tool path by positioning said positional pressure roller tool relative to said material contacting portion in a direction normal to said tool path.

19. The method of Claim 17 wherein said partial pressure roller tool has a second roller, said method further comprising:

re-locating said robotic arm such that said second roller engages said flange extending from said periphery; and

manipulating said robotic arm to move said positional pressure roller tool along a second tool path such that said second roller forms said flange over a periphery of said second sheet material.

20. The method of claim 19 wherein a portion of said first tool path overlaps with a portion of said second tool path such that said roller performs an initial forming operation and said second roller performs a subsequent forming operation.

21. The method of claim 19 wherein said first tool path is distinct from said second tool path such that said roller forms a first portion of said flange and said second roller forms a second portion of said flange.

22. The method of claim 17 further comprising dispensing a mastic on at least one of said first sheet material and said second sheet material such that said first sheet material adheres to said second sheet material when formed and joined.